Index

American Mathematical Society (AMS), 132, 223
American Mathematical Association of Two-Year Colleges (AMATYC), 97
  AMAYTC Standards, 133–34, 152–53
Appreciation of mathematics, 25
  beauty of mathematics, 6, 10, 134–35, 227
  enjoy mathematics, 6, 10
  hate mathematics, 10
  nature of mathematics, 17
  part of culture, 18, 29
  role in society, 17
  utility of mathematics, 21, 134, 135
Assessment
  external, 229–30
  importance of, 201
  learning from, 229–30
  of mathematics curriculum, 104–5
  of Web resources, 76
  professional development needs, 160, 230
  standards, 100

Back-to-basics movement, 5, 38
Brownell, William, 2, 228

Cambridge Conference on School Mathematics
  Goals for School Mathematics, 99
College Entrance Examination Board (CEEB)
  founding of, 223
  Program for College Preparatory Mathematics, 99
Conference Board of the Mathematical Sciences (CBMS), 38, 42
Connections (interdisciplinary), 17, 26, 29, 30, 32, 34, 36

Dewey, John, 132, 226

Equity in mathematics education, 3–4, 7, 13, 131, 141, 197–98, 200, 208–9
  inequities of teacher shortages, 231
  Mathematics Equity Pedagogy Program, 198 (*See also* Mathematics for all students)
Functional mathematics, 127–48, 228
  blend of traditional and reform, 135
  list of topics, 153–57

Hall, G. Stanley, 225
Hutchins, Robert Maynard, 132

International Commission on the Teaching of Mathematics, 1, 223

Language of mathematics, 134, 136
  communication, 6, 84
  construction of , 201, 204
  in bilingual classrooms, 198, 200, 206–7
  notations and representations, 47, 204–5
Learning mathematics, 133
  as sense-making activity, 115–16, 209
  barriers to, 4, 198
  constructivism, 147, 213
  context-based, 118–19
  for mastery, 147
  for systems thinking, 136, 145
  for transfer, 2
  for understanding, 2, 116, 141
  purpose of , 2, 16, 17, 18, 29, 98, 133, 134, 227
  stimulus-response theory, 2
Literacy
  mathematical, 3, 120
  quantitative (or numeracy), 24–25, 28, 32, 35, 129
  statistical, 186

Mathematical applications, 16, 23, 143–47
as making connections, 119–20
embedded in objects around us, 23
technology facilitates, 23
to other disciplines, 29–34
Mathematical Association of America (MAA)
National Committee on Mathematical Requirements, 97
Mathematical (discourse) communities, 94, 213, 220
cross-cultural, 82, 87
classroom as, 209
extranets, 83–94
methods for developing, 188, 189–95, 199, 213–17
supporting equity, 208–9
Web-based, 83, 189, 195
Mathematical Sciences Education Board (MSEB), 107
Mathematics
algebra, 1, 3, 18, 47, 60, 96, 98, 100, 103–4, 107, 108, 121, 137, 144, 147, 153, 156
computation, 16, 154
calculus, 2, 5, 10, 19, 20, 24, 52, 54, 57, 60, 74, 96, 103, 121, 128, 130, 134
geometry, 18, 19, 21, 56, 69, 98, 103, 108, 154
measurement, 154
modeling, 84, 113–15, 156, 201
problem solving, 5, 9, 16, 43–45, 55, 68, 119, 133, 139
reasoning and proof, 5, 16, 31, 32, 42, 43–45, 85, 104, 105, 116, 154, 156, 229
Mathematics curricula and innovative programs, 6, 26, 29, 113, 116, 119, 123, 125–26
Mathematics education
as lifelong activity, 10, 13
challenges for, 224–34
conditions for change in, 232
history of, 1–3, 10, 223–24
improving, 13–14
teacher shortages, 231
Mathematics for all students, 3, 6, 9, 23, 28, 29, 34, 98, 120, 124, 133, 224–26
some mathematics not for all, 21, 23, 25, 31
tracking, 225
Mathematics for the workplace, 3, 16, 101–2, 120, 127–48, 227
vocational mathematics, 129
Math wars, 128
McMurry, Frank, 97, 107, 223
Moore, Eliakim Hastings, 96–97, 107, 132

National Advisory Committee on Mathematics Education (NACOME), 38, 99
Overview and Analysis of School Mathematics: Grades K–12, 100
National Assessment of Educational Progress (NAEP), 12, 51, 57, 103, 104–5, 130
National Commission on Excellence in Education (NCEE)
A Nation at Risk, 38, 131
National Council of Supervisors of Mathematics (NCSM), 5
National Council of Teachers of Mathematics (NCTM), 5, 6–7, 31, 37–49, 84, 100, 107, 112, 128, 224
Agenda for Action, 5, 38
Assessment Standards for School Mathematics, 100
Commission on Post-War Plans, 3, 98
Commission on Standards for School Mathematics, 38
Commission on the Future of the Standards, 41–42
Professional Standards for Teaching Mathematics, 38, 100, 188, 226
Standards 2000 Project, 41
Standards 2000 Writing Group, 41–49
NCTM *Curriculum and Evaluation Standards for School Mathematics*, 6–7, 31, 37–49, 57, 97, 100, 112, 133, 151–52
as framework for systemic reform, 39
as policy tool, 39, 44–45
as tool for teachers, 44–46
as work-in-progress, 7, 39–40
Content Standards, 43–44

criticism of, 40, 128
history of, 37–49
Process Standards, 40, 43–44, 133
research on impact, 39
NCTM *Principles and Standards for School Mathematics*, 7, 37–49, 84, 112, 158, 225–26, 233
Association Review Groups (ARGs), 41–42, 48
as tool for teacher discussion and reflection, 44–46, 60, 233
Discussion Draft, 42–49, 100, 106–7
research behind, 42
National Defense Education Act, 4
National Education Association, 97
Committee of Ten on Secondary School Studies, 2, 223
National Institute of Education (NIE)
Basic Mathematics Skills and Learning Conference (Euclid Conference), 5, 100
National Research Council (NRC), 48, 100, 107, 229
Everybody Counts: A Report to the Nation on the Future of Mathematics Education, 100
National Science Foundation (NSF), 4, 39, 76, 79, 99, 107, 113
history of, 98–99
NSF-sponsored curriculum development projects, 39, 100, 113–25
Systemic Initiatives, 39
Nature of mathematics
as a collection of rules, 19
as a construction of the human mind, 19
as a creative medium, 21–23
as a means for making visible the invisible, 19–21
as a science of patterns, 19, 140
as a way of knowing or explaining, 16, 18, 115
New Math, 4, 227
criticism of, 5

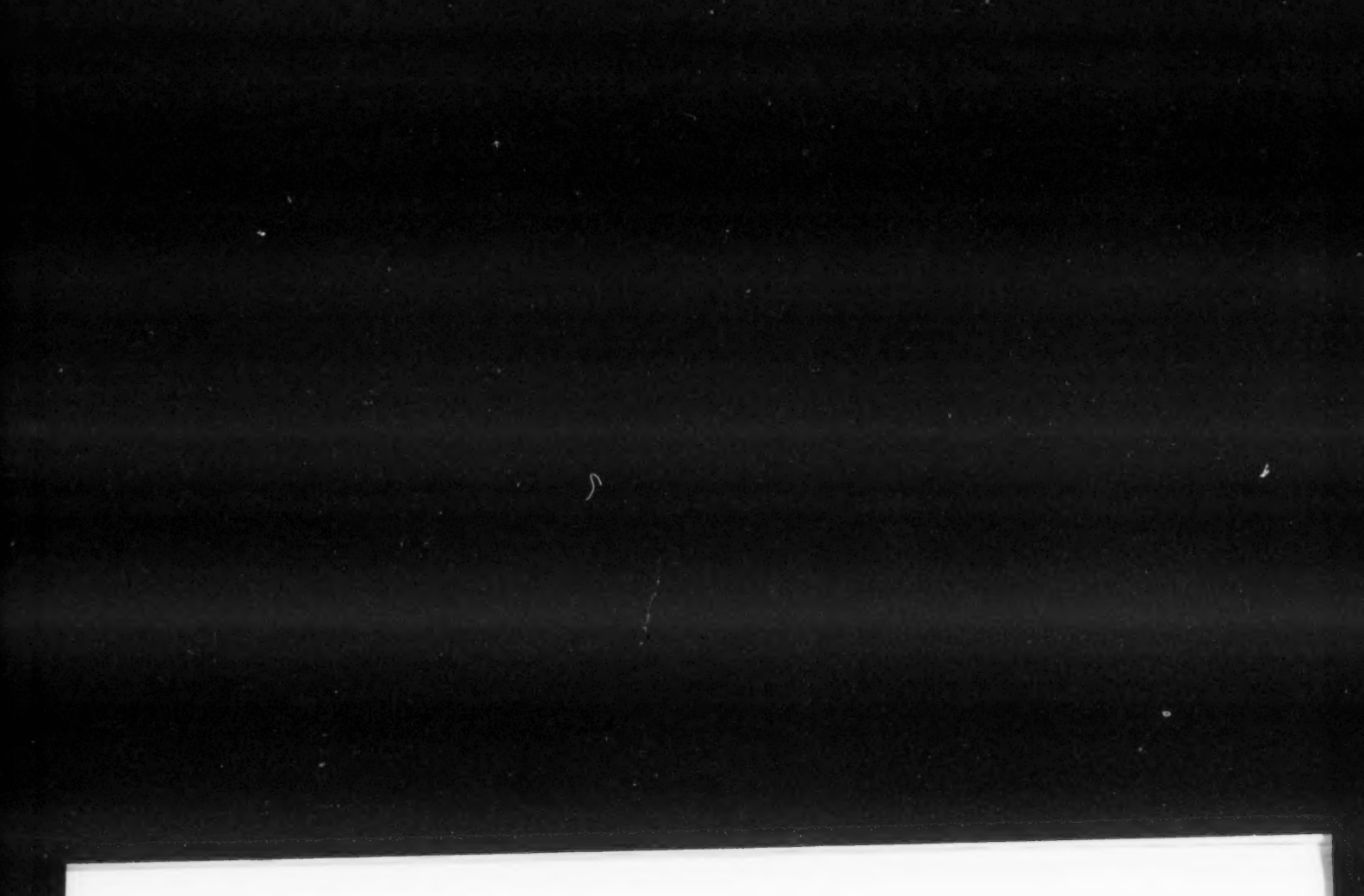
Professional development
as reflective practice, 231–33
effective, 53–54
implications of technology for, 60
need for collaborative practice, 230
research on, 231
Teachers Teaching with Technology Program, 53–54
Progressive Education Association, 3
Progressive education movement, 3

School mathematics curriculum
a mile wide and inch deep, 46, 136
compartmentalization, 2, 96–97
context-based, 68–73, 102, 137, 140
course-taking patterns, 103
focus on utility, 3, 102
growth in twentieth century, 1–2, 100
integration of topics, 2, 5, 13, 97, 108, 119–20
national curriculum, 6
need for balance in, 26, 59–60, 129, 132, 137, 209, 228
needs of twenty-first century, 13, 108, 134, 153–57, 171–73
ordering of topics, 124, 137
organized around themes, 137
traditional secondary framework, 100, 102–4, 129
School Mathematics Study Group (SMSG), 4, 99
Science and Public Policy Report (Steelman Report), 98–99
Second International Mathematics Study (SIMS), 100, 103
Skills
basic, 6, 7, 8, 11, 46, 102, 118, 147
early research on , 3
knowledge, 203
needed for future, 9
occupational, 139
paper-and-pencil, 54–60, 228
Smith, David Eugene, 1, 223
Sputnik, 4
Standards
AMATYC Standards (*See* AMATYC)
in response to societal demands, 31
in relation to individual needs, 31–34
NCTM Standards (*See* NCTM)
necessarily indeterminate, 40, 233

state frameworks and textbook guidelines, 7, 39, 41, 105–6, 133, 152
universal standards and ecological parallel, 28, 31, 132
Statistics
association between variables, 163–67
data analysis, 85, 88–93, 136, 155, 159–62, 178–86
experiments, 170–77
inference, 156, 168–70
resampling (bootstrap methods), 168–70
simulations, 77, 168–70
surveys, 170–71

Teacher preparation, 4, 14, 25, 35, 79, 98, 120–22
Teaching methods
art of questioning and problem posing, 88–89, 213, 217
calculator impact on, 56
for appropriate use of technology (*See* Technology)
for building discourse
use of children's literature and storytelling, 201, 214
Explain, Build On, Go Beyond strategies, 188–94
for exploratory data analysis, 174–86
for functional mathematics, 138–42
for reaching disadvantaged, 198–200
for working with families, 207–8
models for teaching
anticipant model, 226–27
contingent model, 226–27
teacher as guide or facilitator, 3, 97
using linked multiple representations, 56
Technology, 7, 11, 55–56
calculators/computers, 8, 17, 51–64
appropriate use of, 9, 11–12, 58–61, 123, 175–78, 228
history of, 52
research on use of, 12, 57–58
impact on
access issues, 53
basic skills, 57–58, 129–30
learning priorities, 140
mathematics curriculum, 54–55, 55–56, 97
student needs, 102
teaching methods, 60
textbooks, 104
supports
lab approaches to mathematics, 140
problem solving, 58
understanding, 141, 148
visualization, 145
tools and software, 56, 59, 62–63, 71–75, 73–75, 122–23, 144, 175–78
the Web, 67–80
digital libraries, 68, 76, 78–79
Internet, 63
resource discovery, assessment, and reliability, 75–77
Third International Mathematics and Science Study (TIMMS), 46, 58, 64, 100, 103, 120, 131
TIMSS Video Study, 105
Thorndike, E. L., 2, 3

U.S. Department of Labor
What Work Requires of Schools (SCANS Report), 134, 153
University of Illinois Committee on School Mathematics (UICSM), 4, 99 (*See also* New Math)
Vygotsky, Lev , 201

Whitehead, Alfred North, 8

Young, J. W. A., 223